United States Patent [19]

King

[11] **3,868,073**

[45] **Feb. 25, 1975**

[54] **PROPULSION SYSTEM FOR AIRCRAFT**

[76] Inventor: **Myron L. King,** c/o Lyzon Art Galleries, 411 Thompson Ln., Nashville, Tenn. 37211

[22] Filed: **Jan. 30, 1974**

[21] Appl. No.: **438,025**

[52] **U.S. Cl.** ..... **244/34 A**

[51] **Int. Cl.** **B64c 3/10**

[58] **Field of Search** ..... 244/65, 34 A, 34 R, 12 R, 244/12 CW, 13, 15

[56] **References Cited**

UNITED STATES PATENTS

1,365,339	1/1921	Olhovsky	244/65 X
1,956,054	4/1934	Wagner	244/12 CW
2,118,052	5/1938	Odor	244/34 A UX
2,510,959	6/1950	Custer	244/12 CW

FOREIGN PATENTS OR APPLICATIONS

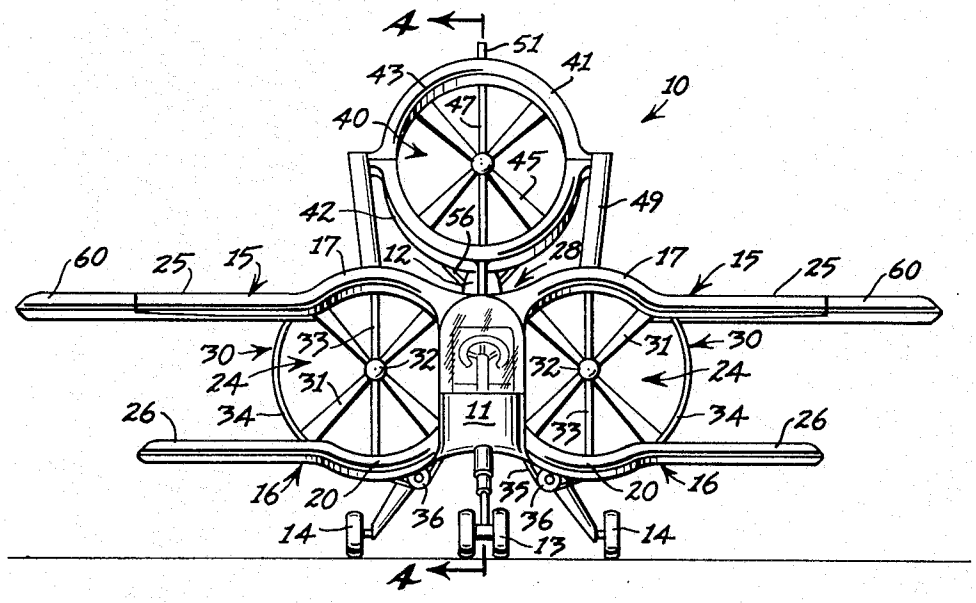
1,091,843	4/1955	France	244/34 A

Primary Examiner—Trygve M. Blix
Assistant Examiner—Paul E. Sauberer
Attorney, Agent, or Firm—Harrington A. Lackey

[57] **ABSTRACT**

An aircraft having pairs of upper and lower air foils projecting from opposite sides of the fuselage, with upper and lower arcuate portions defining a pair of air ducts. A propeller is rotatably mounted behind each air duct so that the path of the propeller tips is above the respective trailing edges of the upper arcuate air foils. The upper arcuate air foils merge to form a trough which air is pulled by the propeller tips rotating toward each other.

9 Claims, 5 Drawing Figures



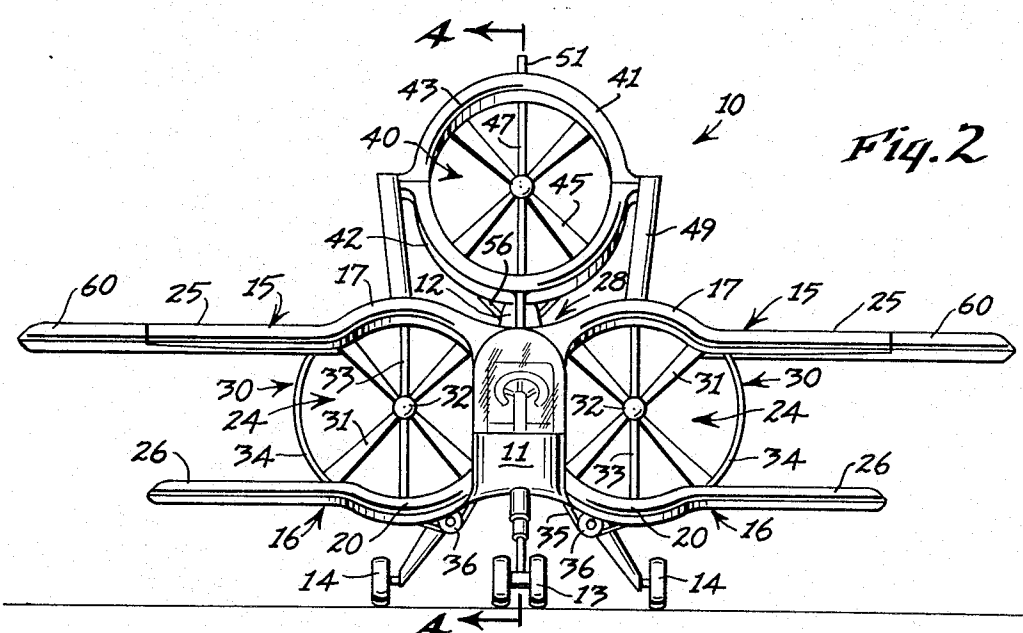

4
51
41
43
47
40
10
45
42
49
56
28
17
12
15
25
60
30
33
32
31
24
34
26
11
16
20
35
36
14
13

Fig. 2

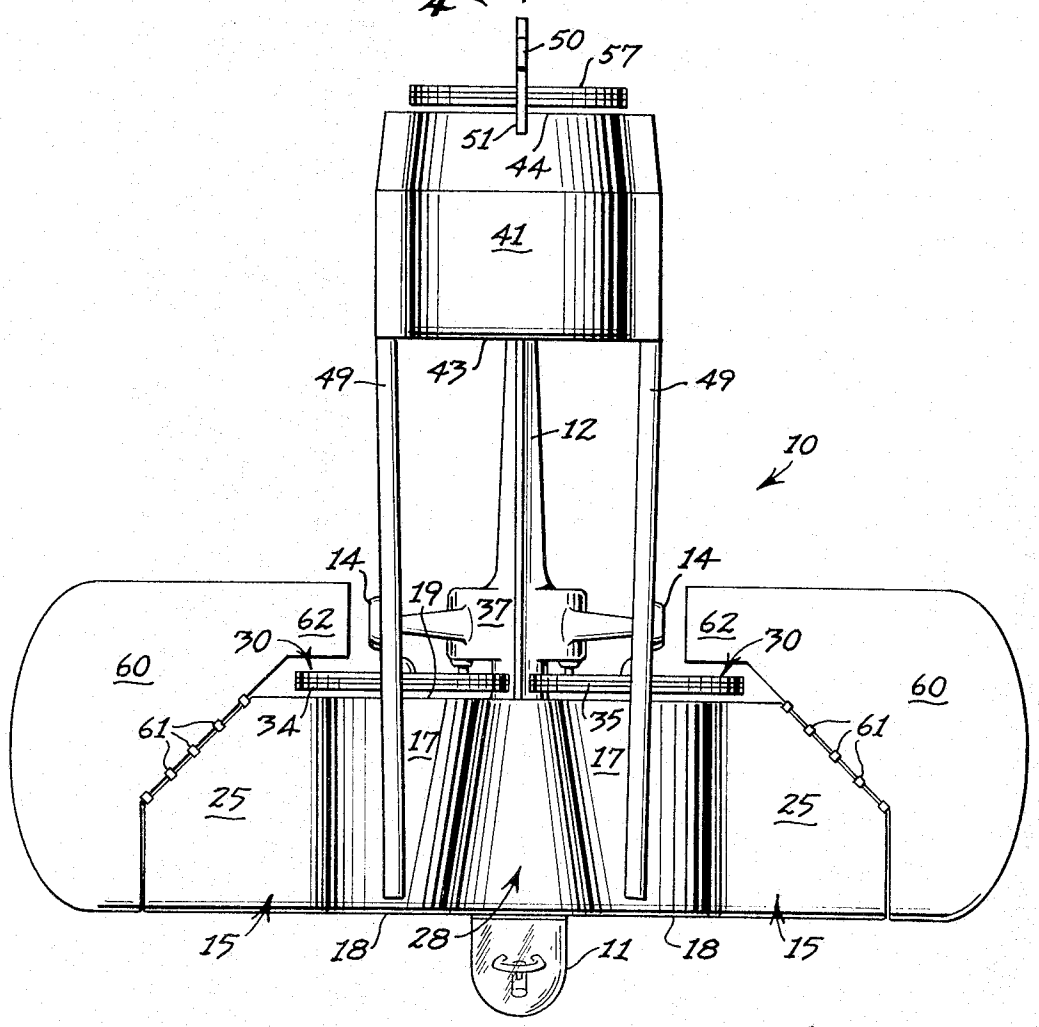

4
50
57
51
44
41
49
43
12
10
14
19
37
62
30
60
61
34
17
35
25
15
18
28
11

Fig. 1

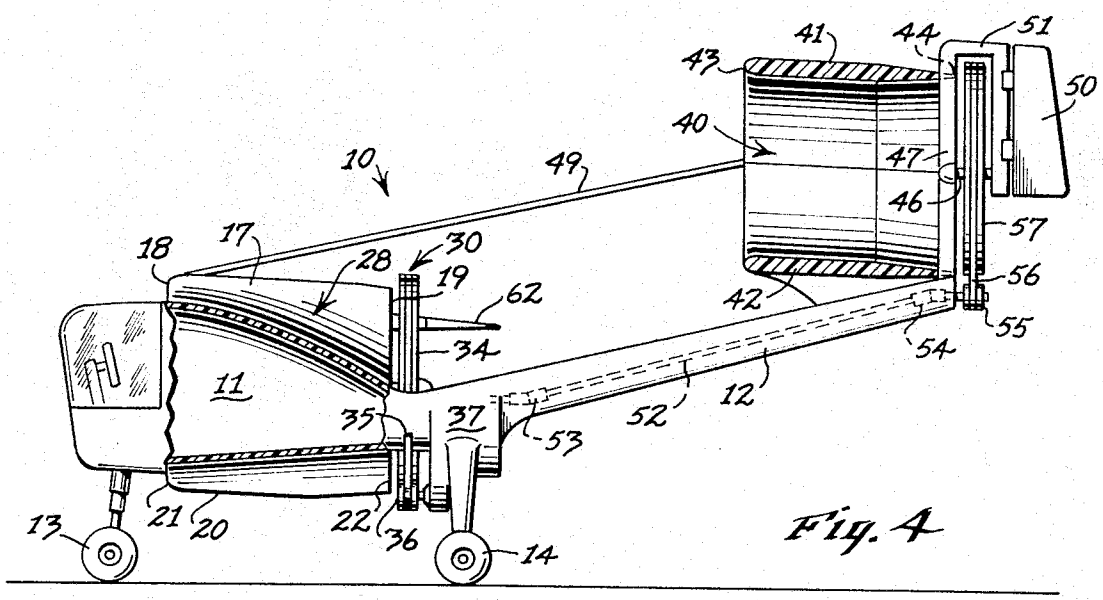


Fig. 4

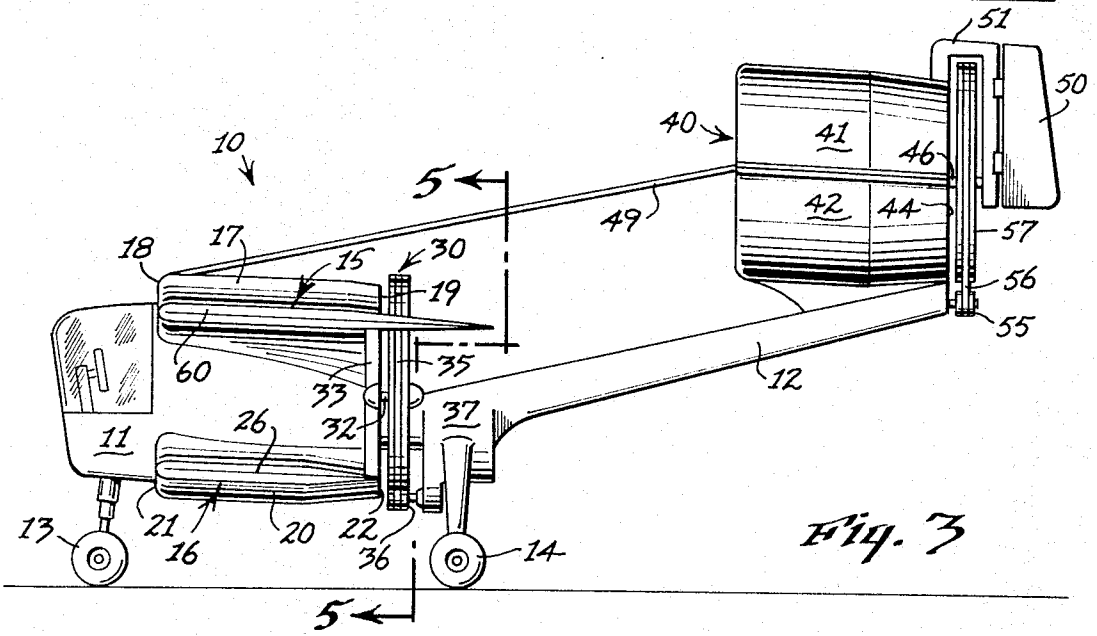


Fig. 3

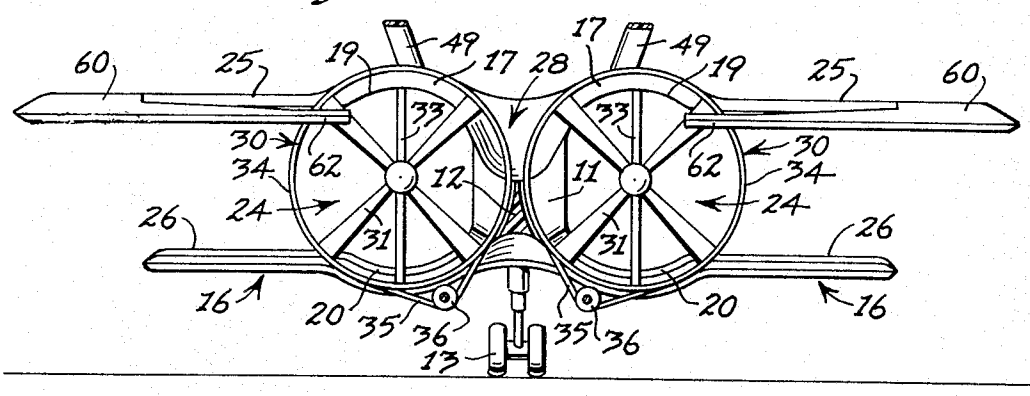


Fig. 5

PROPULSION SYSTEM FOR AIRCRAFT

BACKGROUND OF THE INVENTION

This invention relates to aircraft, and more particularly to a propulsion system for aircraft.

Various types of VTOL aircraft and aircraft adapted for short take-offs have been developed, as represented in U.S. Pat. Nos. 2,918,230 of Lippisch; 2,929,580 of Ciolkosz; 2,974,899 of Fowler; and 3,350,035 of Schlieben. The aircraft in these patents employ louvers, or means for turning the propellers relative to the fuselage, in order to direct the propelled air in different directions, including down, to assist in the vertical or short take-off.

SUMMARY OF THE INVENTION

It is an object of this invention to provide an aircraft, preferably a small aircraft, whose propulsion system is designed for a high degree of lift, but a relatively slow speed, in order to effect short take-offs.

The propulsion system made in accordance with this invention is a combination of particularly shaped air foils and propellers especially arranged relative to the air foils.

The air foils are arcuate portions of biplane wing members having opposed concave surfaces to form air ducts on opposite sides of the fuselage. The upper air foils preferably converge into each other, and also preferably into the top surface of the fuselage to form a "Venturi" trough. Rotatably mounted behind each air duct is a propeller in which the rotary path of the propeller tips is above the trailing edges of the upper arcuate air foils, including the trailing edge of the trough, and also is approximately level with or above the trailing edges of the lower air foils.

The propellers are driven in opposite directions so that they move toward each other as they pass the trailing edges of the upper air foils. This movement of the propellers above the trailing edges of the upper air foils creates vacuum not only over the top surfaces of the upper air foils, but also in the trough, to substantially augment the lift of the aircraft. Negative pressure is also formed over the top surfaces of the lower air foils to provide additional lift. The propellers also, of course, provide the necessary thrust for moving the aircraft forward.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a top plan view of the aircraft embodying this invention;

FIG. **2** is a front elevation of the aircraft;

FIG. **3** is a left side elevation of the aircraft;

FIG. **4** is a view similar to FIG. **3**, with a portion of the fuselage shown in section along the line **4—4** of FIG. **2**, and

FIG. **5** is a section taken along the line **5—5** of FIG. **3**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in more detail, the aircraft **10** made in accordance with this invention includes a fuselage including a cabin **11** and an elongated tail boom **12** supported upon the ground by landing gear **13** and **14**.

The aircraft **10** is essentially a biplane having upper wing members **15** projecting laterally outward from both sides of the top of the cabin **11**, and lower wing members **16** projecting laterally from the fuselage **11** beneath the upper wing members **15**.

The inner portion of each wing member **15** is an arcuate-shaped air foil **17** extending transversely convex upward and having a leading edge **18** and a trailing edge **19**.

In a similar manner, the inner portions of each lower wing member **16** is in the form of arcuate air foil **20** extending transversely convex downward, and having a leading edge **21** and a trailing edge **22**. The lower air foils **20** are vertically below the upper air foils **17** so that the opposing concave surfaces of the respective air foils **17** and **20** generally define a pair of passages or ducts **24**.

The outer portions of the wing members **15** are substantially planar wing sections **25**, while the outer projecting portions of the lower wing members **16** are also substantially planar wing sections **26** substantially parallel to the upper wing sections **25**.

The upper air foils **17** converge not only with each other, but with the top of the fuselage or cabin **11**, to form an elongated trough **28**. As best disclosed in FIG. **4**, the trough **28** declines in a streamlined surface rearward.

A propeller **30** is journalled for rotation behind each air duct **24**. Each propeller **30** includes propeller blades **31** fixed on shaft **32** journalled for rotation in appropriate bearings in the bearing struts **33** fixed between the air foils **17** and **20**. The propeller blade tips are connected by a peripheral drive ring **34** having outer circumferential grooves for receiving a drive belt **35**. The drive belt **35** is driven by drive pulleys **36** counter-rotated by appropriate drive means, such as an internal combustion engine and transmission, within the drive housing **37** forming a part of the fuselage.

The tips of the propeller blades travel in a circular path which is above the trailing edges **19** of the upper air foils **17** and approximately the same level as the trailing edges **22** of the lower air foils **20**, as best illustrated in FIG. **5**. It will also be observed in FIG. **5** that the rotary path of the blade tips also overlaps or is above the trailing edge of the trough **28**. The rotary path of the tips of the propeller blades **31** is, of course, indicated in the drawings by the rotary movement of the driven ring **34**.

The drive pulleys **35** are driven in opposite directions so that the movement of the blade tips across the trailing edges **19** of the upper air foils **17** are toward each other, and therefore toward the trough **28**. This movement of the tips of the blades **31** above the trailing edges **19** draws air rearward over the tops of the upper air foils **17**, thereby producing a net negative pressure above the upper air foils **17** to create lift. Furthermore, the movement of the propeller blades **31** toward each other across the trailing edge of the trough **28** draws air inward and rearward through the valley created by the trough **28** to create substantial negative pressure above the trough **28** to provide a cumulative lift effect upon the aircraft **10**.

It is important that the rotary path of the tips of the blades **31** not be below the trailing edges **22** of the lower air foils **20** so that a net negative pressure will not be created by the propellers **30** below the lower air foils **20**. To the contrary, the movement of the propeller

blades **31** will create a net negative pressure above the lower air foils **20** to provide lift for the lower wing members **16.** Thus, the shape of the air foils **17** and **20,** the converging air foils forming the trough **28,** and the rotational directions of the propellers **30,** create cumulative lift over various areas of both wing members **15** and **16.**

Fixed to the rear end of the tail boom **12** is a tail duct **40,** of substantially circular configuration, having an upper arcuate air foil segment **41** and a lower arcuate air foil segment **42,** both of which have leading edges **43** and trailing edges **44.** In the configuration of the tail duct **40,** both air foil segments **41** and **42** are jointed along their sides to form a closed tubular duct. A tail propeller **45** of identical construction to the front propellers **30** is fixed on the shaft **46** for rotation in a bearing in the bearing struts **47** fixed on the tail duct **40.**

The rotary path of the blades in the propeller **45** is also above the trailing edge **44** of the upper air foil segment **41** and substantially level with the trailing edge **44** of the lower air foil segment **42.** The propeller **45** thus creates negative pressure over the top of the upper air foil segment **41** and over the top surface of the lower air foil segment **42,** to effect lift in the tail duct **40.** The dail duct **40** may be additionally supported by elongated side struts **49** fixed to the upper surfaces of the upper air foils **17.**

Although the guidance mechanism for the aircraft **10** is not a part of this invention, nevertheless a rudder **50** may be rotatably mounted within bearings in a rudder support **51** fixed to the top of the air foil segment **41,** and controlled by controls not shown, if desired.

The tail propeller **45** may be driven in the same manner as the front propellers **30,** and from the same engine in the drive housing **37,** through drive shaft **52,** universal joints **53** and **54,** drive pulley **55** and driven belt **56** around the drive ring **57** of the tail propeller **45.**

When the tail duct **40** and tail propeller **45** are employed, it is important for most efficient operation that the tail duct **40** be mounted above and out of the slipstreams of the front propellers **30.**

The outer ends of the upper wing sections **25** are preferably joined to ailerons **60** by hinges **61** for movement, by controls not shown in the cabin **11,** either up or down about the axes of the hinges **61.** Thus, the ailerons **60** may be used for controlling the ascent and descent of the aircraft **10,** and might also be used for guidance to the right or left.

Preferably, the ailerons **60** are provided with inwardly projecting baffle portions **62,** which not only project toward each other, but also project behind both corresponding front propellers **30,** so the baffle portions may be used for diverting the slipstream from the propellers **30** in different vertical directions, that is either up or down or horizontally.

The wing members **15** and **16,** as well as the tail duct **40** are preferably made of lightweight cellular material of certain minimum strength, such as solid polystyrene foam molded to the desired shapes and covered with "Dynel" fabric and epoxy resin, in accordance with a method well-known in the art. Such construction is not only extremely light, but also extremely strong.

It is therefore seen that the aircraft **10** is provided with propulsion means in the form of the air foils **17** and **20,** the trough **28,** the propellers **30,** as well as the air duct **40** and tail propeller **45,** for creating substantial cumulative lift, as well as forward propulsion for take-off and landing in areas of limited dimensions.

What is claimed is:

1. A propulsion system for aircraft comprising:

a. a fuselage having a front-to-rear longitudinal axis,

b. an upper air foil fixed to said fuselage and having a leading edge and a trailing edge,

c. said upper air foil extending arcuately, convex upward, transversely of said fuselage,

d. a lower air foil fixed to said fuselage, having a leading edge and a trailing edge, and spaced substantially vertically below said upper air foil,

e. said lower air foil extending arcuately, convex downward, transversely of said fuselage, so that the opposed, spaced, concave surfaces of said air foils generally form an air duct,

f. a rotary propeller having blade tips,

g. means rotatably mounting said propeller behind said duct and adjacent the trailing edges of said air foils so that the rotary path of said propeller tips is above the trailing edge of said upper foil, but not below the trailing edge of said lower air foil, and

h. means for driving said propeller.

2. The invention according to claim **1** in which the arcuate portions of the trailing edges of both said air foils form circular arcs, each of said arcs being concentric with the rotary axis of said propeller, and the arc of the trailing edge of the lower air foil having a radius substantially equal to the radius of said propeller tips.

3. The invention according to claim **1** in which said upper air foil comprises a right upper air foil projecting from the right side of said fuselage and a left upper air foil projecting from the left side of said fuselage, said lower air foil comprising a right lower air foil projecting from the right side of said fuselage and a left lower air foil projecting from the left side of said fuselage, said propeller comprising a right propeller and left propeller.

4. The invention according to claim **3** in which said right and left upper air foils converge to form a longitudinal trough concave upward, the rotary paths of said propeller tips being adjacent each other, and the means for driving said propellers being adapted to drive said propellers in opposite directions so that said right and left propeller tips move toward each other when moving along the trailing edges of said upper air foils.

5. The invention according to claim **4** in which said trough comprises a top surface portion of said fuselage.

6. The invention according to claim **4** in which said trough declines rearward.

7. The invention according to claim **3** in which the portions of all said air foils fixed adjacent said fuselage comprise the arcuate portions forming said left and right ducts, said air foils further comprising substantially planar wing members projecting transversely outward and rigid with said arcuate portions to form biplane wing members.

8. The invention according to claim **7** further comprising right and left planar aileron members, means hinging said right aileron member to the outer end of said upper right wing member, and means hinging said left aileron member to the outer end of said left upper wing member.

9. The invention according to claim **8** in which each of said aileron members comprises baffle portions projecting inward behind the corresponding propellers.

* * * * *